Lab 7 Statistics

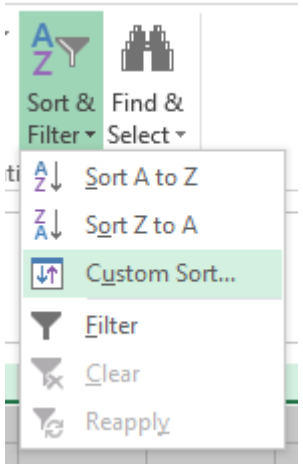
Lab 7

- Using the flicker data, calculate a t-test in SPSS
- Write up both a methods and results section for the experiment

Data Formatting in Excel

- Sort by “Participant” and then by “Condition”
  - This preserves participant-level pairing
- Copy “RT” for all of the “Flicker” values to another Excel file
  - Name this column “RT, flicker”
- Now copy the rest of the “RT” values to the new Excel file and put these in a new column
  - Name this column “RT, no flicker”
- Save new Excel file as a .csv file

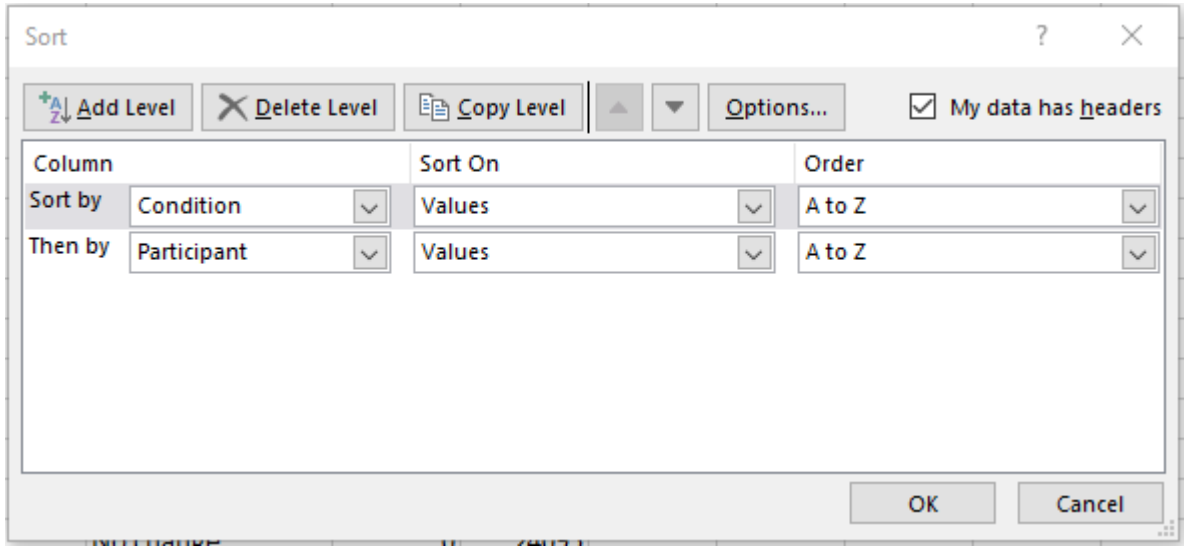
Data Formatting in Excel



Make sure that all of your data is highlighted and then go to "Sort & Filter" → "Custom Sort…"

Sort by Condition and then Participant.

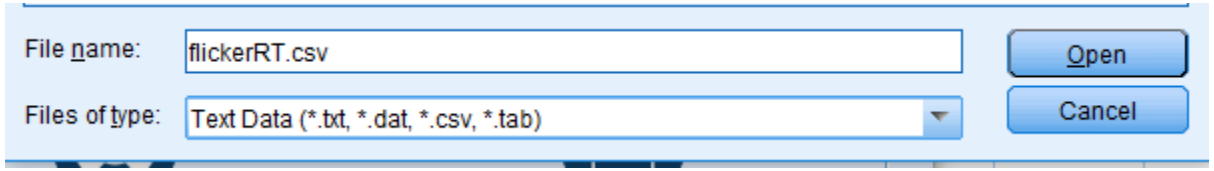
Copy and paste "RT" for "Flicker" and then "No flicker" to a new Excel file.



RT, no flicker	RT, flicker
2827	5023
2492	4881
2551	2113
2115	4736
2431	5510
3491	2286
2144	6152
2003	2967
3982	9831
2889	9440
3128	13402
2323	3259
6790	24095

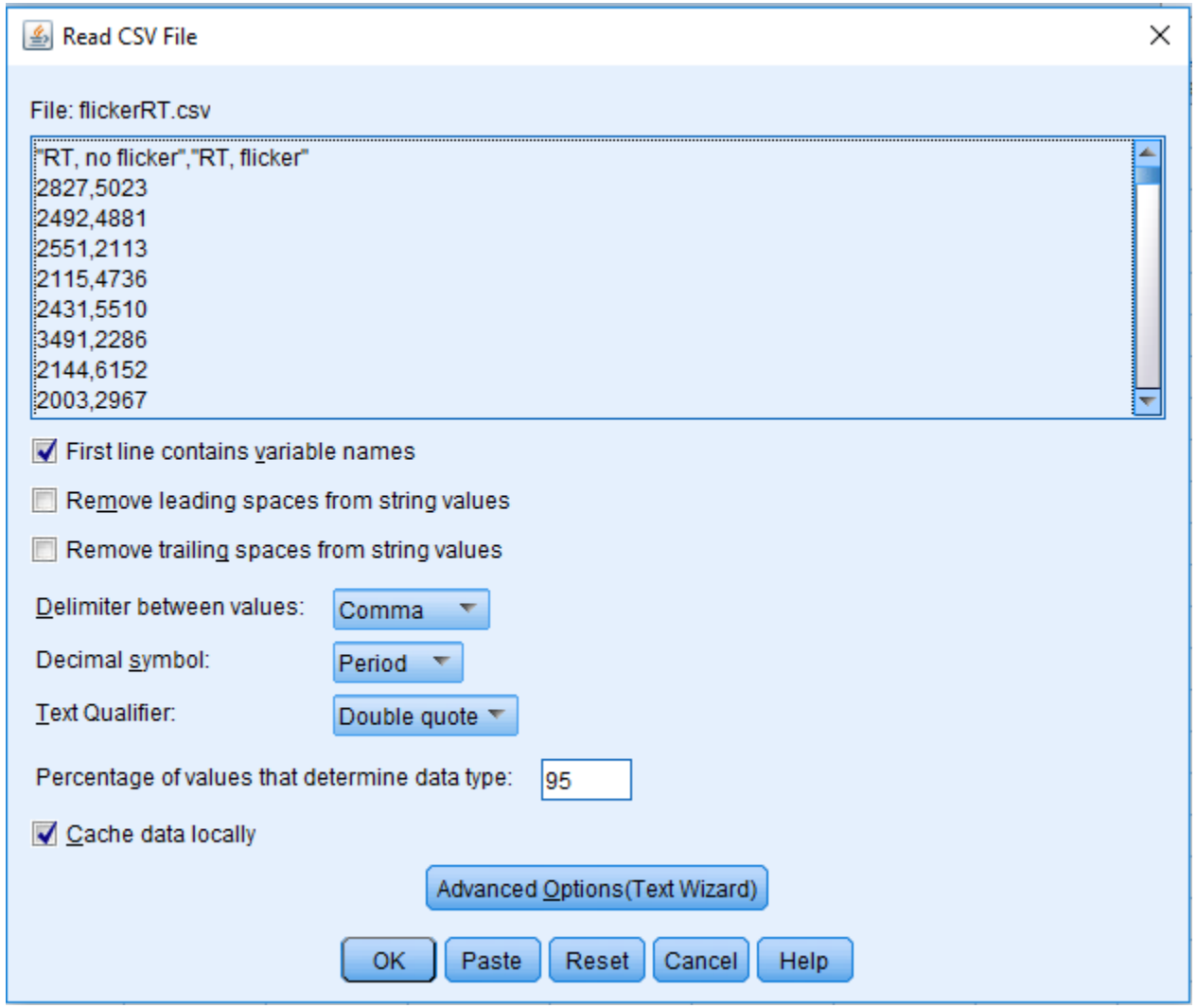
Bringing data into SPSS

- Make sure to close your Excel file before trying to open it in SPSS!
- Click on “Open another file…” and browse for the folder where you saved your data.
  - Make sure that “Files of type:” says “Text Data (*.txt, *.dat, *.csv, *.tab)
- Click on your saved data and click “Open”

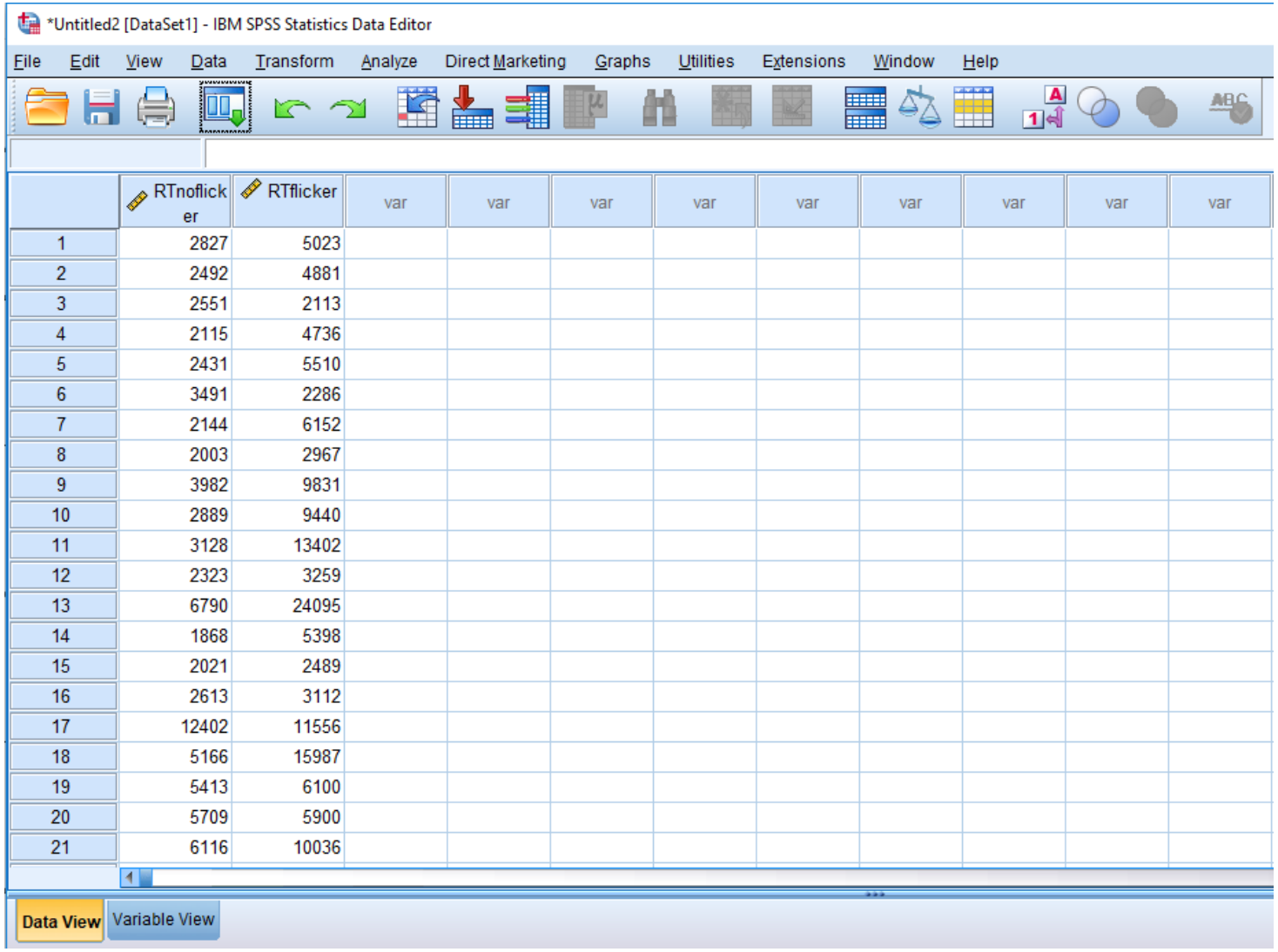


- If you titled the columns in Excel, make sure that “First line contains variable names” is selected. Otherwise, unselect this option.
- Click “OK” and your data should appear in SPSS

Bringing Data into SPSS



SPSS Data View



	RTnoflicker	RTflicker	var	var	var	var	var	var	var	var	var
1	2827	5023									
2	2492	4881									
3	2551	2113									
4	2115	4736									
5	2431	5510									
6	3491	2286									
7	2144	6152									
8	2003	2967									
9	3982	9831									
10	2889	9440									
11	3128	13402									
12	2323	3259									
13	6790	24095									
14	1868	5398									
15	2021	2489									
16	2613	3112									
17	12402	11556									
18	5166	15987									
19	5413	6100									
20	5709	5900									
21	6116	10036									

Paired Sample T-Test

- Now you are ready to perform a paired sample t-test
- We want to know if the mean of RT is different for flicker versus no flicker

We write

$$H_0: \mu_{(flicker)} = \mu_{(no\ flicker)}$$

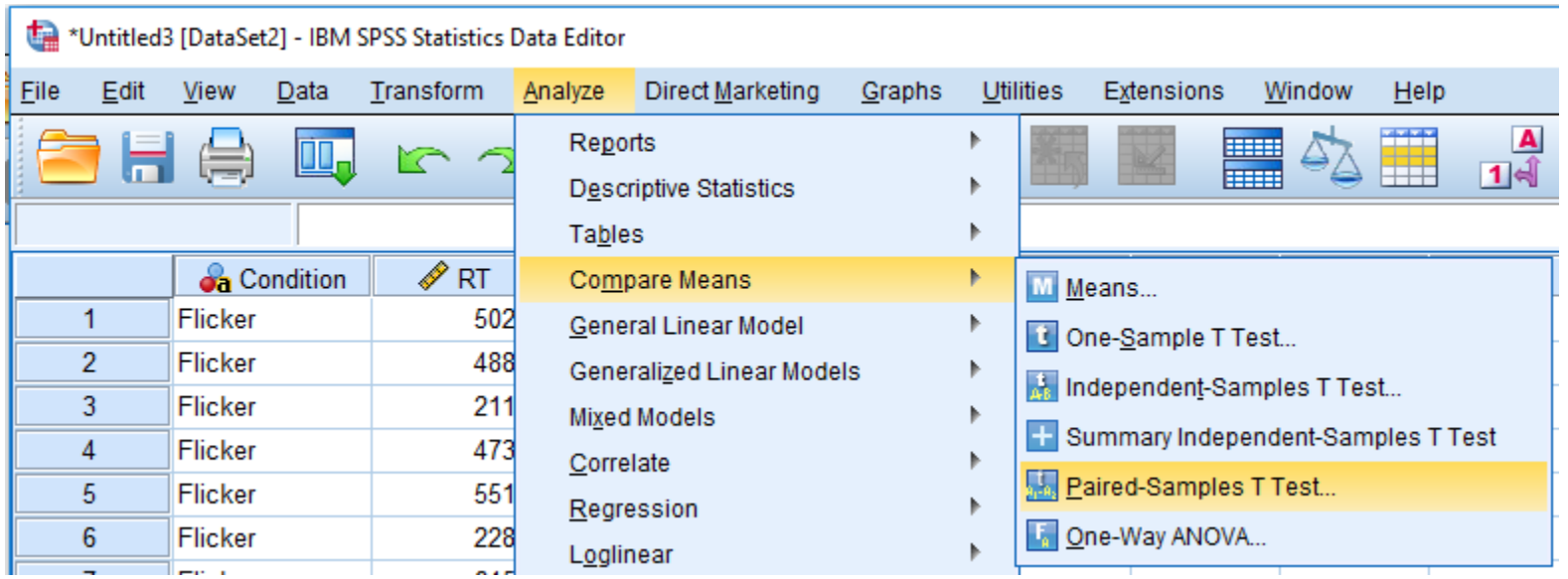
$$H_A: \mu_{(flicker)} \neq \mu_{(no\ flicker)}$$

In words, our null hypothesis is that our two population means are equal. The alternative hypothesis is that the two means are not equal.

- Our samples are paired based on participant and the change condition

Paired Sample T-Test in SPSS

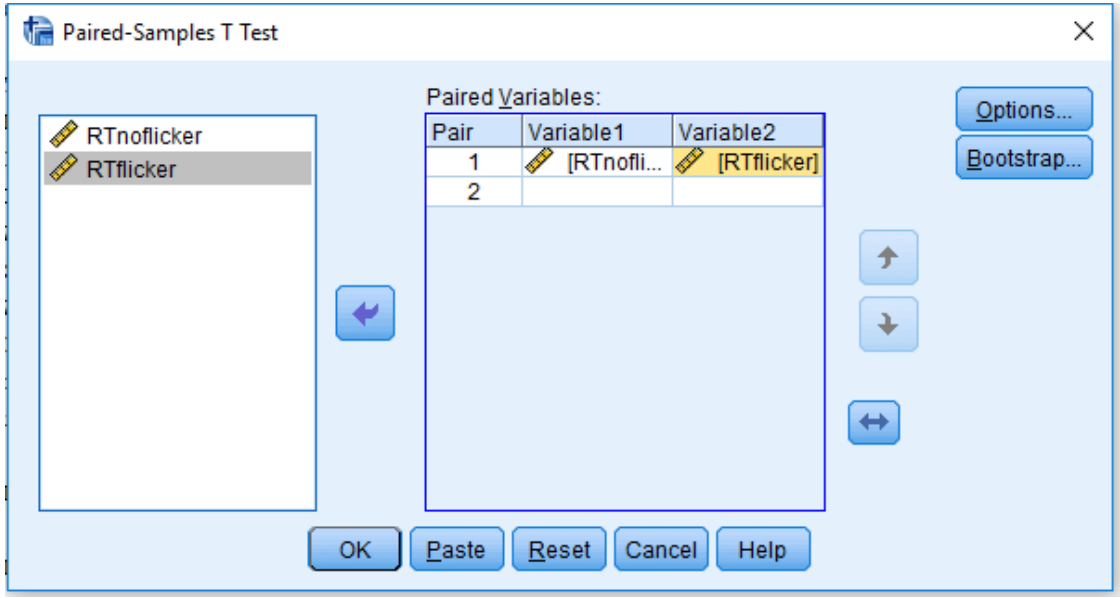
- Click on “Analyze” → “Compare Means” → “Paired-Samples T Test…”



Paired Sample T-Test in SPSS

- Click on “RTnoflicker” and then the arrow
- Then click on “RTflicker” and the arrow

Your window should now look like this.



- Click “Options…” and make sure your “Confidence Interval Percentage” is 100(1-α)%.
- Click “Continue”. This will bring you back to the “Paired Samples T Test” window.
- Click “OK”.

Paired Sample T-Test in SPSS

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	RTnoflicker - RTflicker	-4623.000	10567.904	906.190	-6415.165	-2830.835	-5.102	135	.000

p-value

- Our T-Test results are in the last table that SPSS prints out.
- SPSS only shows 3 decimal places, but our actual p-value is 1.118×10^{-6} or 0.00000118

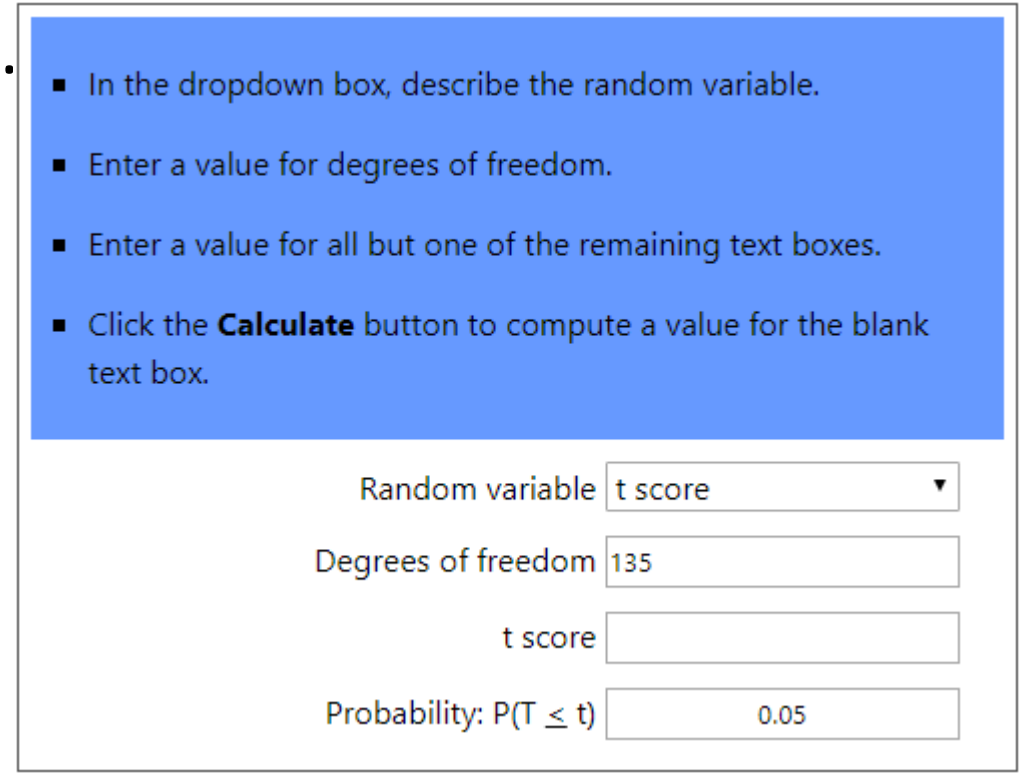
Confidence interval approach: A 95% confidence interval *for the difference in means* is (-6415.165, -2830.835). Since 0 difference is not in our interval, we can conclude that the difference in our means ($\mu_{(flicker)} - \mu_{(no\ flicker)}$) is not 0 (so they must be different).

p-value approach: We reject H_0 if p-value < α. Our p-value = 0.00000118 < 0.05, so we reject H_0 and conclude that our means are different.

Test-statistic approach: our test statistic is t = -5.102 with 135 degrees of freedom (df). We can compare this to a critical value for t. If $|t_{teststat}| > |t_{crit}|$, we reject H_0 and conclude that our means are different.

Finding A Critical Value

- Go to https://stattrek.com/online-calculator/t-distribution.aspx
- Enter the degrees of freedom and α in the applet.
- Click "calculate" to get your critical value.
  - This will show up next to "t score"
- Here, the critical value is -1.656
- Since |-5.102| > |-1.656|, we reject H_0



Which Approach Do I Use?

- All three approaches are exactly equivalent!
- Use whichever one makes the most sense to you.
- Whenever possible, report everything:
  - α, your p-value, your critical value, *and* your test statistic